Tehachapi Renewable Transmission Project

CPUC Workshop

November 21, 2006

Presentation Outline

- Study Assumptions
- PPM Manzana Early Interconnection
- Tehachapi Transmission Projects
  - Antelope Transmission Project Segment 1 (A.04-12-007)
  - Antelope Transmission Project Segments 2&3 (A.04-12-008)
  - Tehachapi Renewable Transmission Project
- Key Issues

Key Assumptions

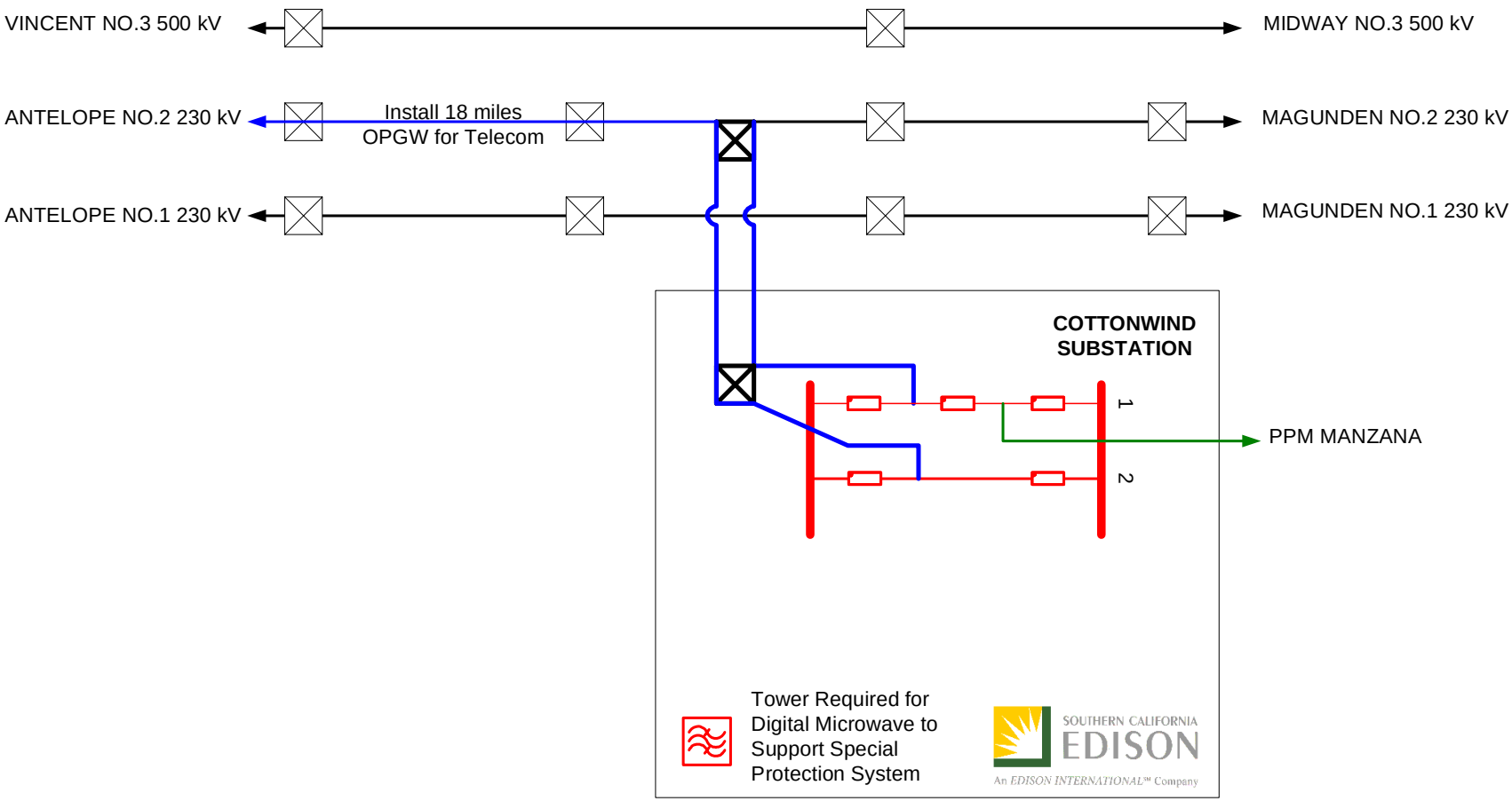
- Permitting
  - All permits for Antelope Transmission Project (ATP) Segments 1, 2, and 3 obtained by 01/07
  - All permits for Tehachapi Renewable Transmission Project (TRTP) obtained by 01/09
  - All Cottonwind permitting obtained from Kern County
- Material Procurement
  - Schedule assumes SCE can initiate engineering, material, and construction contract bid process upon receipt of Draft EIR/DEIS (assumed to be provided to SCE three months before final approvals)
- Construction
  - All 66 kV relocation assumed to be within SCE franchise
  - No restrictions assumed for all 66 kV relocation cutovers
- Estimates
  - Cost and schedule estimates provided without benefit of preliminary engineering

PPM Manzana Early Interconnection

- Major Components
  - New Cottonwind 220 kV Substation
  - Loop Antelope-Magunden No.2 220 kV transmission line
  - Telecomm facilities for Special Protection System
- Project Dependencies
  - CAISO exception to generator Special Protection System guidelines
  - Conditional Use Permit (Kern County Lead Permitting Agency) & Permit to Construct from CPUC
- Cost Estimate: In Progress
- Schedule

Major Component	Engineering		Material		ROW Acq'd	Construction		O.D.
	Start	End	Start	End		Start	End	
All Early Interconnect Work	01/07	11/07	01/07	10/07	12/08	01/08	12/08	12/08

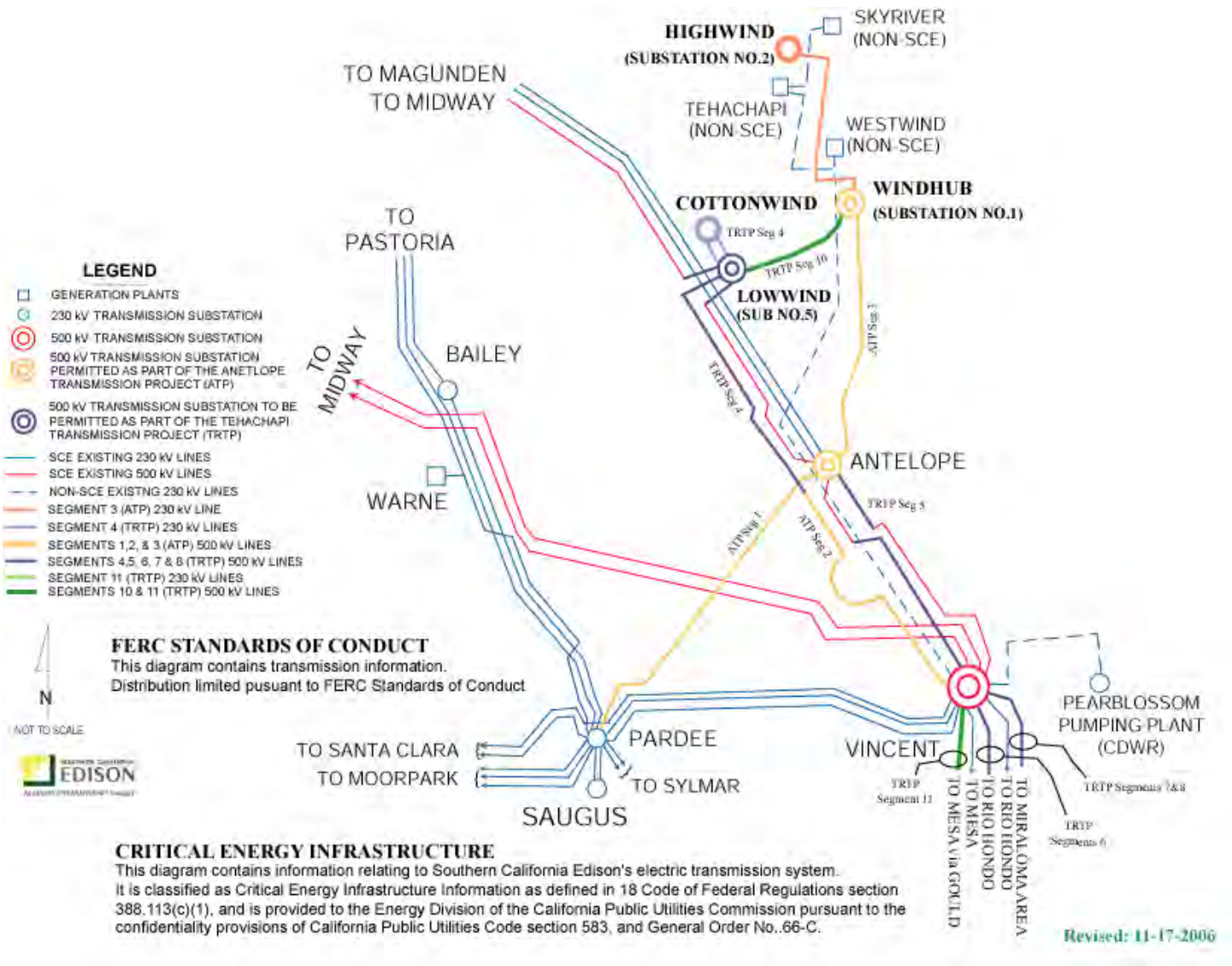
PPM Manzana Early Interconnection



Tehachapi Renewable Transmission Project (TRTP)

- TRTP together with the Antelope Transmission Project Segments 1, 2 and 3 form the Tehachapi Plan of Service evaluated by the CSRTP
- Conceptual Engineering Level Estimates:
  - Total Cost: $1.839 Billion
  - Schedule: All segments completed by 2013
- Purpose: to interconnect up to 4,500 MW of renewable wind generation in the Tehachapi Wind Resource Area
- Plan of service developed as part of California Southern Region Transmission Planning process

Tehachapi Renewable Transmission Project (TRTP)
North Of Vincent Upgrades



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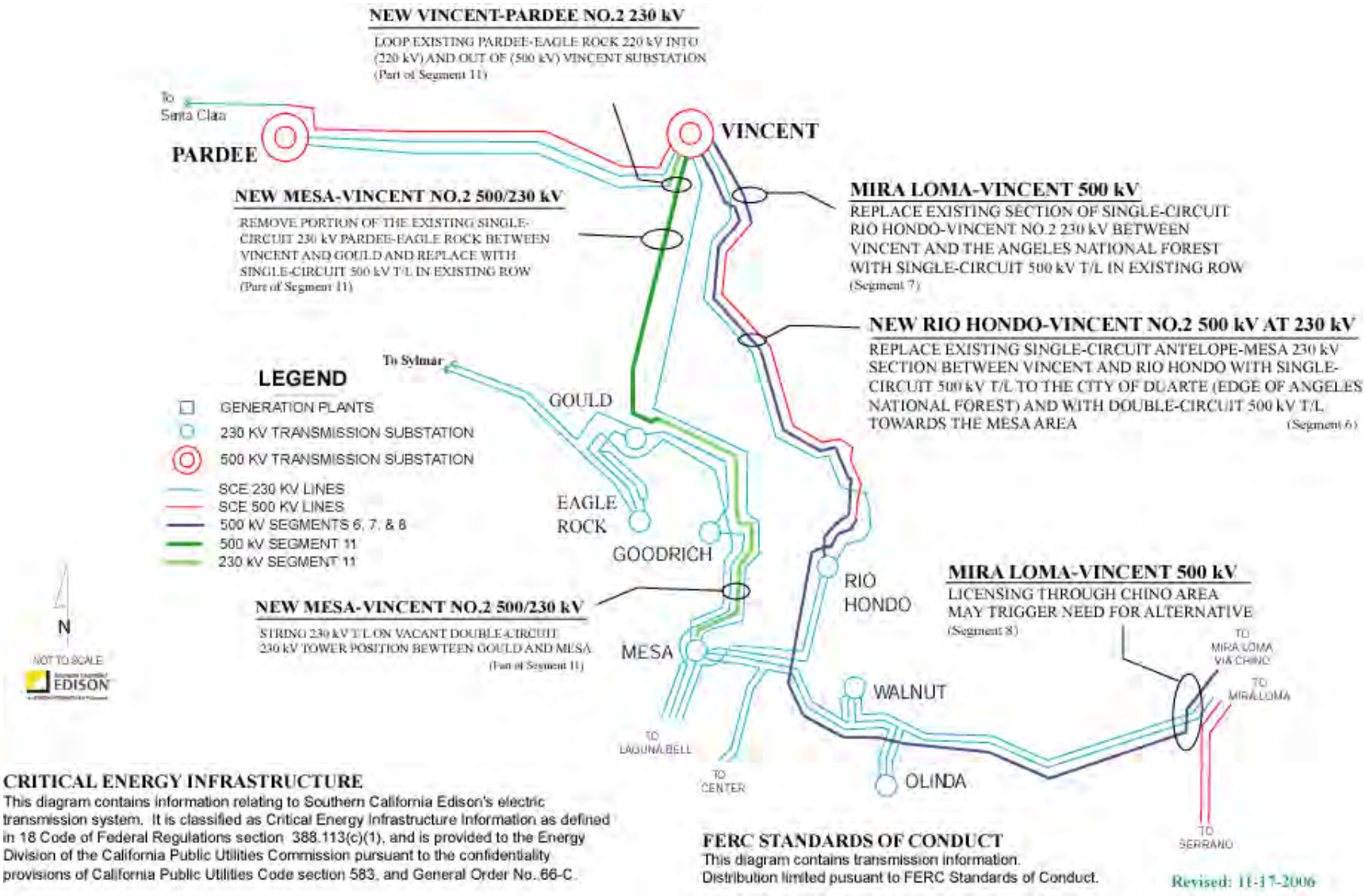
Tehachapi Renewable Transmission Project (TRTP)
South Of Vincent Upgrades



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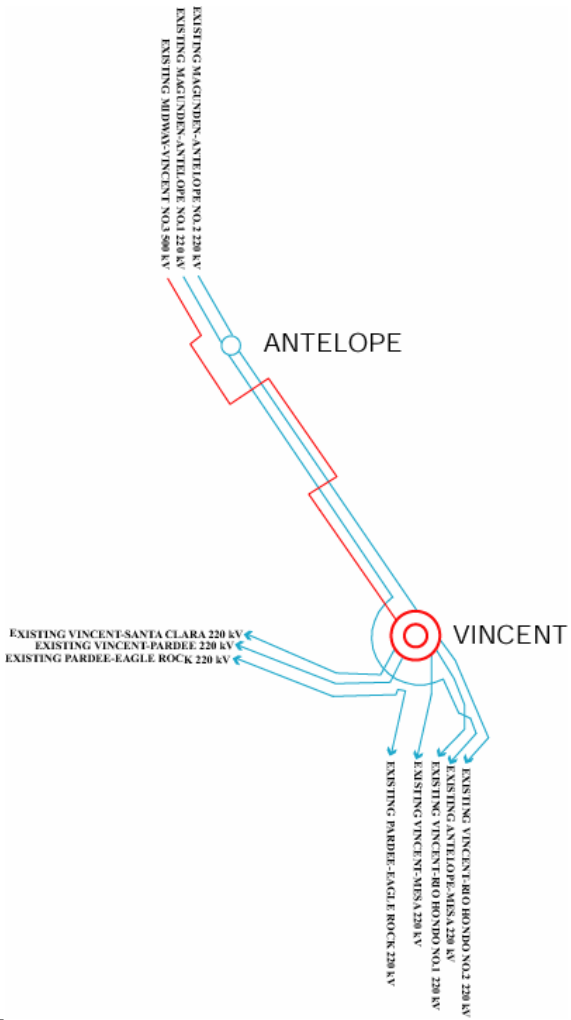
Segment 1
Antelope-Pardee 500 kV and Antelope Expansion

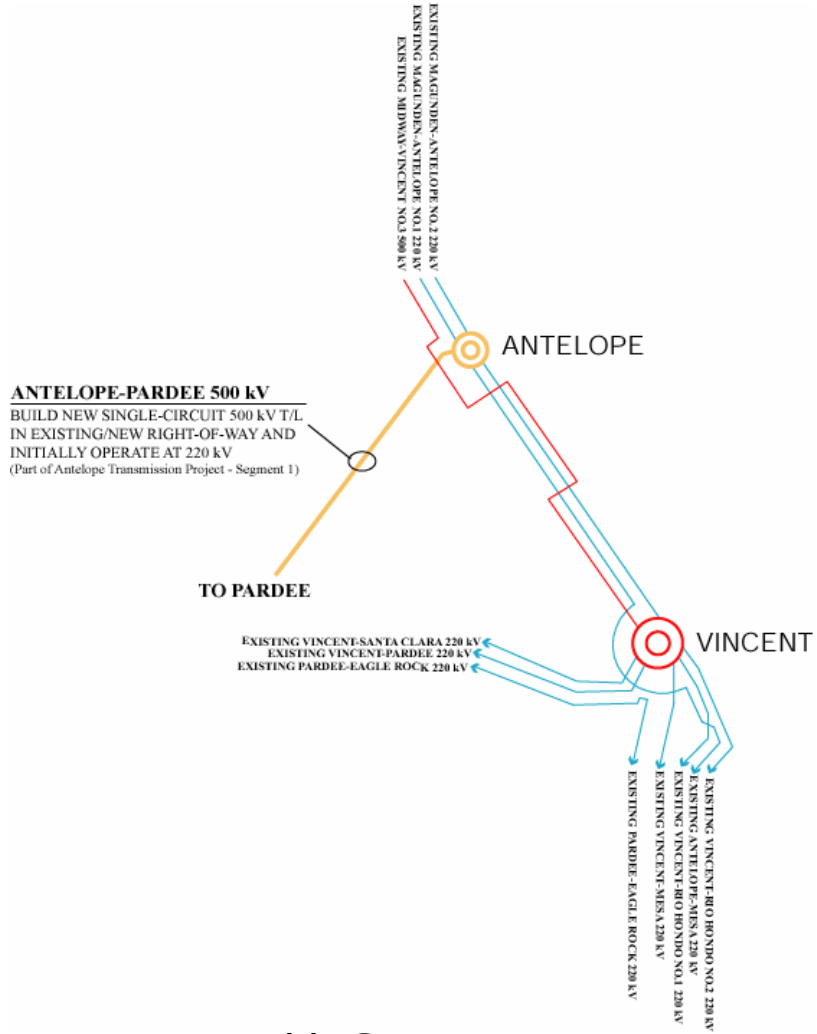
- Major Components
  - Expanded Antelope Substation and Rating Increase to 500 kV
  - New 25.6-mile Antelope-Pardee single-circuit 500 kV Transmission Line
- Segment 1 Dependencies
  - None
- Preliminary Engineering Level Cost Estimate: $91.5 million
- Schedule

Major Component	Engineering		Material		ROW Acq'd	Construction		O.D.
	Start	End	Start	End		Start	End	
Antelope Substation Expansion	12/06	08/07	06/07	02/08	12/07	09/07	12/08	12/08
Antelope-Pardee 500 kV T/L	12/06	08/07	12/06	01/08	12/07	06/07	12/08	12/08

Segment 1
Antelope-Pardee 500 kV T/L & Antelope Substation Expansion

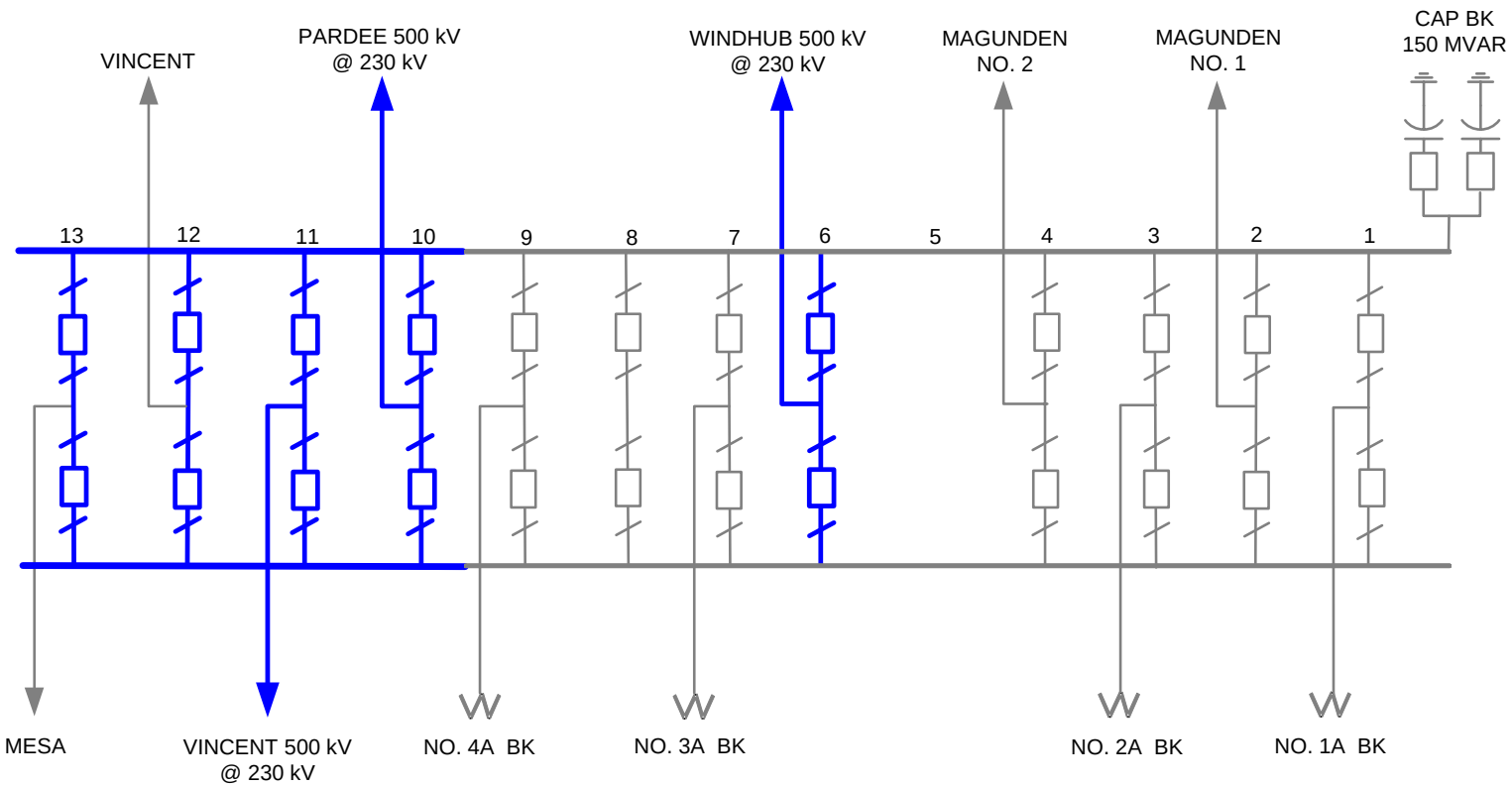


Without Segment 1



With Segment 1

Initial Antelope Substation Expansion

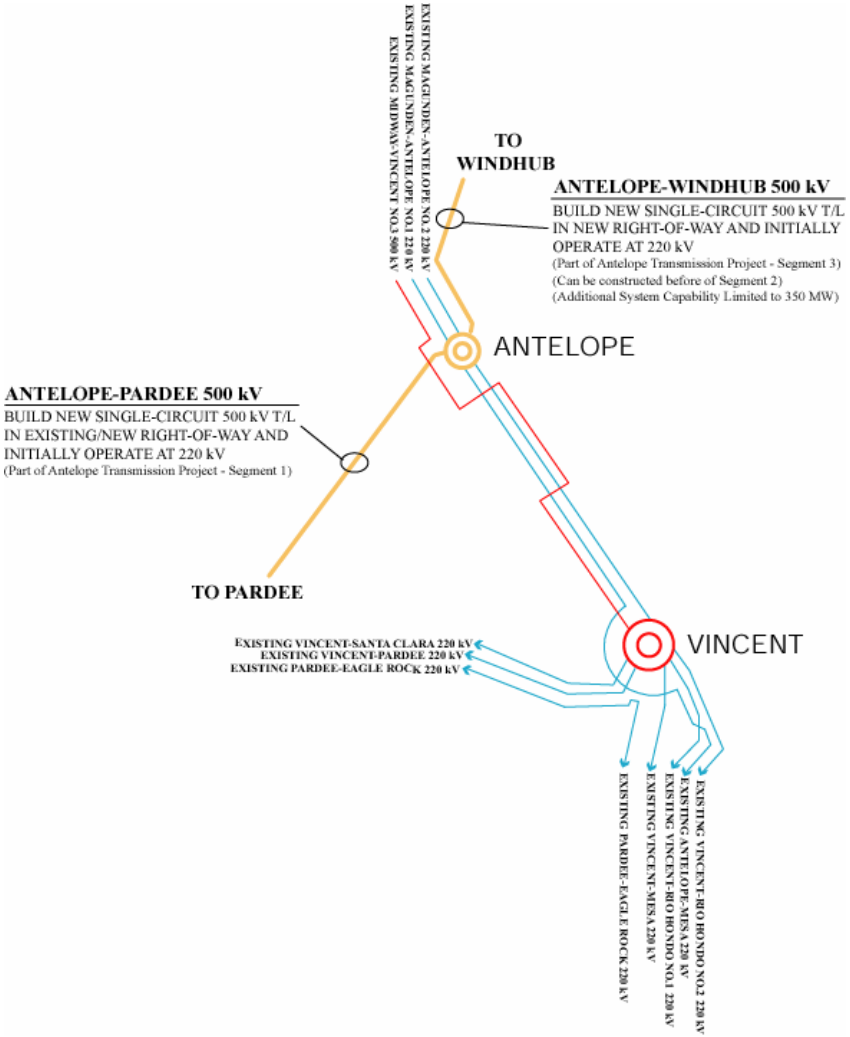


Segments 2 & 3
Antelope-Vincent and Antelope-Tehachapi 500 kV

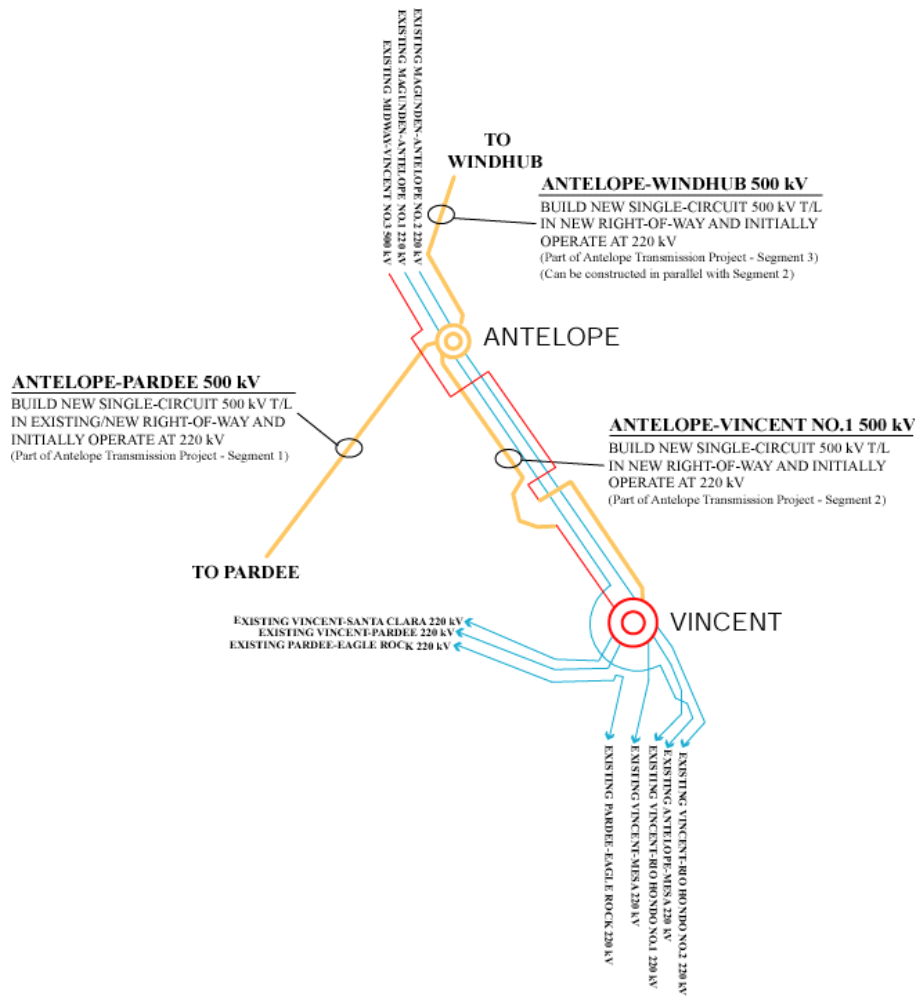
- Major Components
  - New 21.0-mile Antelope-Vincent single-circuit 500 kV transmission line
  - New 25.6-mile Antelope-WindHub single-circuit 500 kV transmission line
  - New 9.6-mile WindHub-HighWind single-circuit 220 kV transmission line
  - Two New Tehachapi area substations (WindHub and HighWind)
- Segment 2&3 Dependencies
  - Antelope Transmission Project Segment 1 (Antelope-Pardee)
- Preliminary Engineering Level Cost Estimate: $180 million
- Schedule

Major Component	Engineering		Material		ROW Acq'd	Construction		O.D.
	Start	End	Start	End		Start	End	
Antelope-Vincent 500 kV T/L	12/06	08/07	06/07	02/08	12/07	01/08	01/09	01/09
Antelope-WindHub 500 kV T/L	12/06	08/07	06/07	02/08	12/07	01/08	03/09	03/09
WindHub-HighWind 220 kV T/L	12/06	08/07	06/07	02/08	12/07	01/08	03/09	03/09
Initial WindHub Sub Facilities	12/06	08/07	07/07	03/08	12/07	04/08	03/09	03/09
Initial HighWind Sub Facilities	12/06	08/07	07/07	03/08	12/07	04/08	03/09	03/09

Segment 2
Antelope-Vincent No.1 500 kV T/L

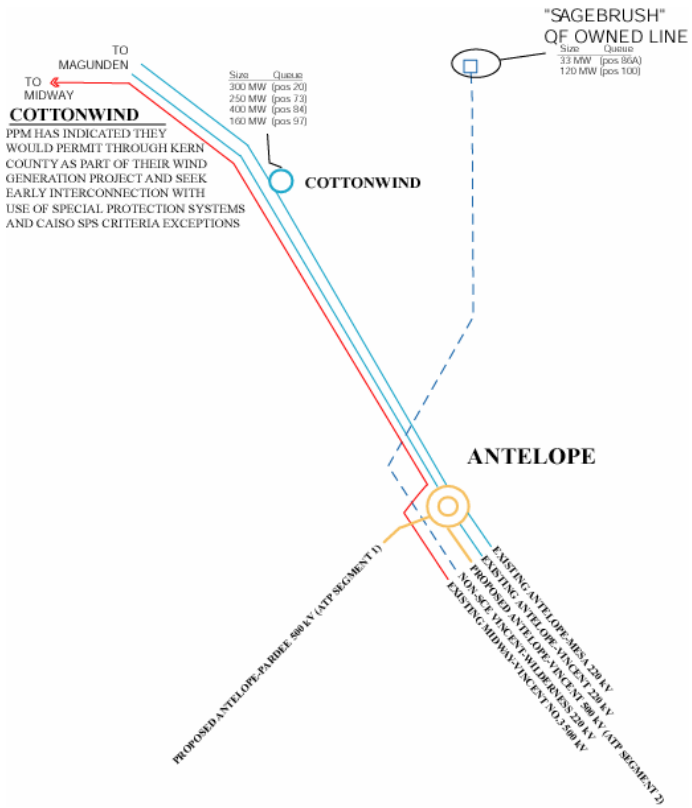


Without Segment 2

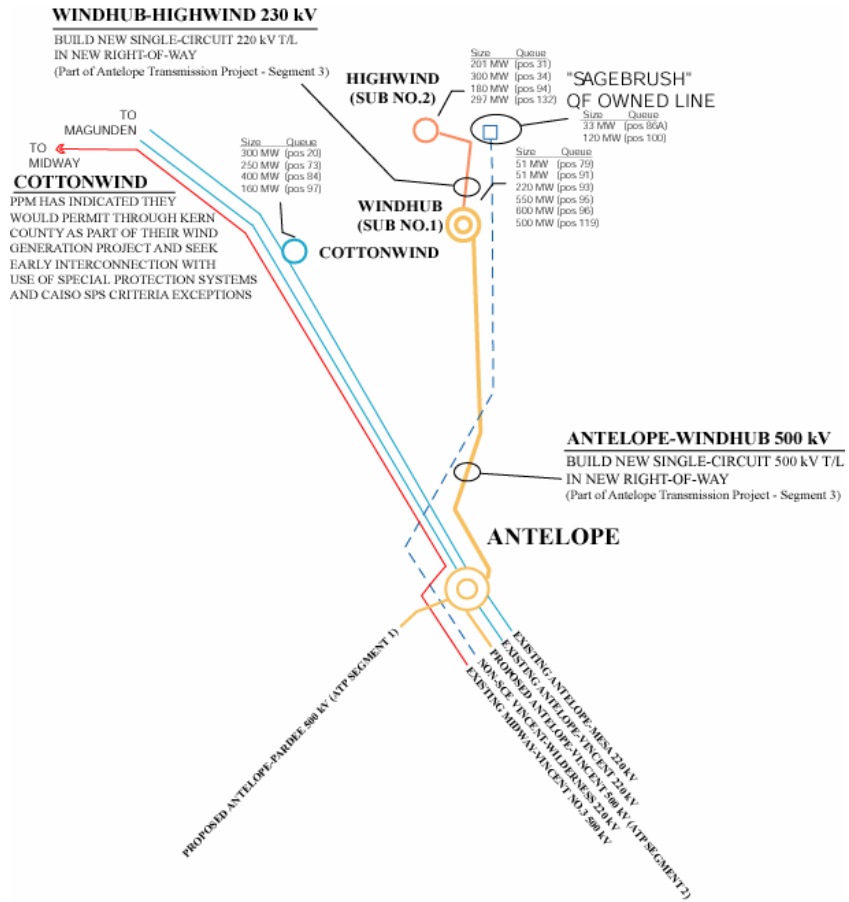


With Segment 2

Segment 3
Antelope-WindHub 500 kV & WindHub-HighWind 230 kV



Without Segment 3



With Segment 3

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Segment 4
LowWind 500 kV and 220 kV Transmission Elements

- Major Components
  - New 500/220 kV Substation (LowWind) and connection to existing Path 26
  - New 4-mile LowWind-Cottonwind double-circuit 220 kV T/L
  - New 14-mile Antelope-LowWind single-circuit 500 kV T/L (Antelope at 500 kV is part of Segment 9)
- Segment 4 Dependencies for only new 14-mile 500 kV T/L
  - Antelope Transmission Project Segment 1 (Antelope-Pardee)
  - Antelope Transmission Project Segment 2 (Antelope-Vincent No.1 500 kV)
  - Tehachapi Renewable Transmission Project Segment 5 (Antelope-Vincent No.2 500 kV)
  - Portion of Tehachapi Renewable Transmission Project Segment 9 (Antelope at 500 kV)
- Conceptual Engineering Level Cost Estimate: $318 million
- Schedule* (Antelope Operation at 500 kV part of Segment 9)

Major Component	Engineering		Material		ROW Acq'd	Construction		O.D.
	Start	End	Start	End		Start	End	
New 500/230 kV Substation	11/08	10/09	02/09	08/10	08/10	08/10	08/11	08/11
Path 26 "Loop-In" Connection	11/08	10/09	08/09	10/10	08/10	10/10	08/11	08/11
LowWind-Cottonwind 220 kV T/L	11/08	10/09	12/09	02/11	08/10	02/11	08/11	08/11
Antelope-LowWind 500 kV T/L	11/08	10/09	08/09	10/10	10/10	10/10	08/11	08/11

* LowWind radial 220 kV service to Antelope can be implemented six months earlier

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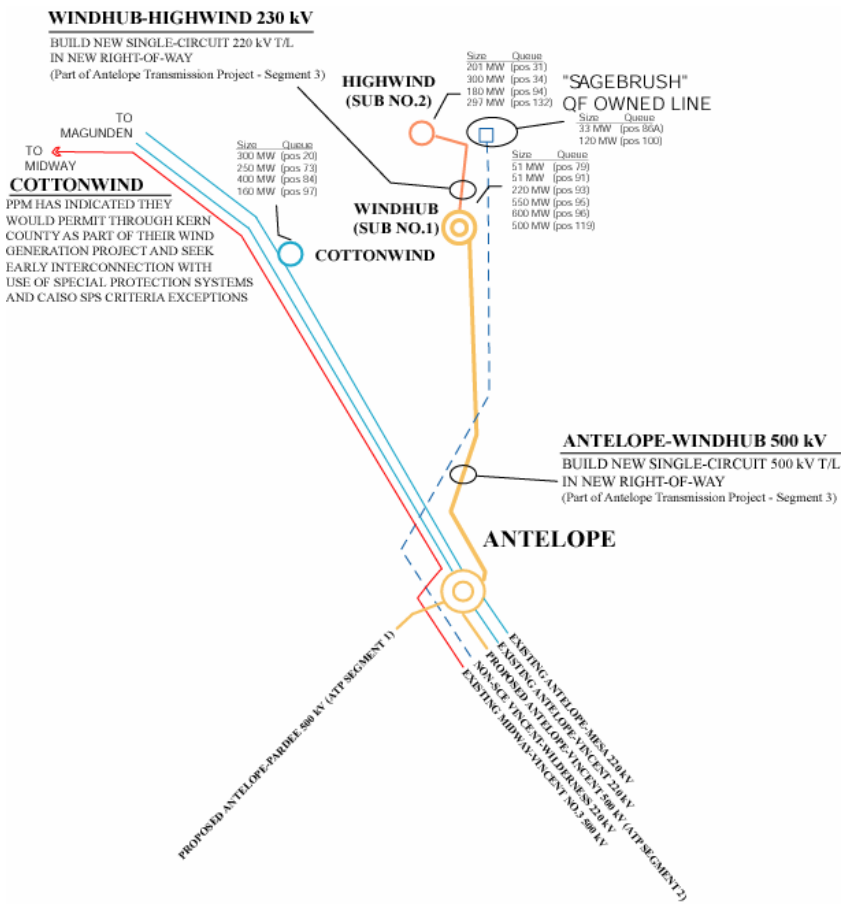
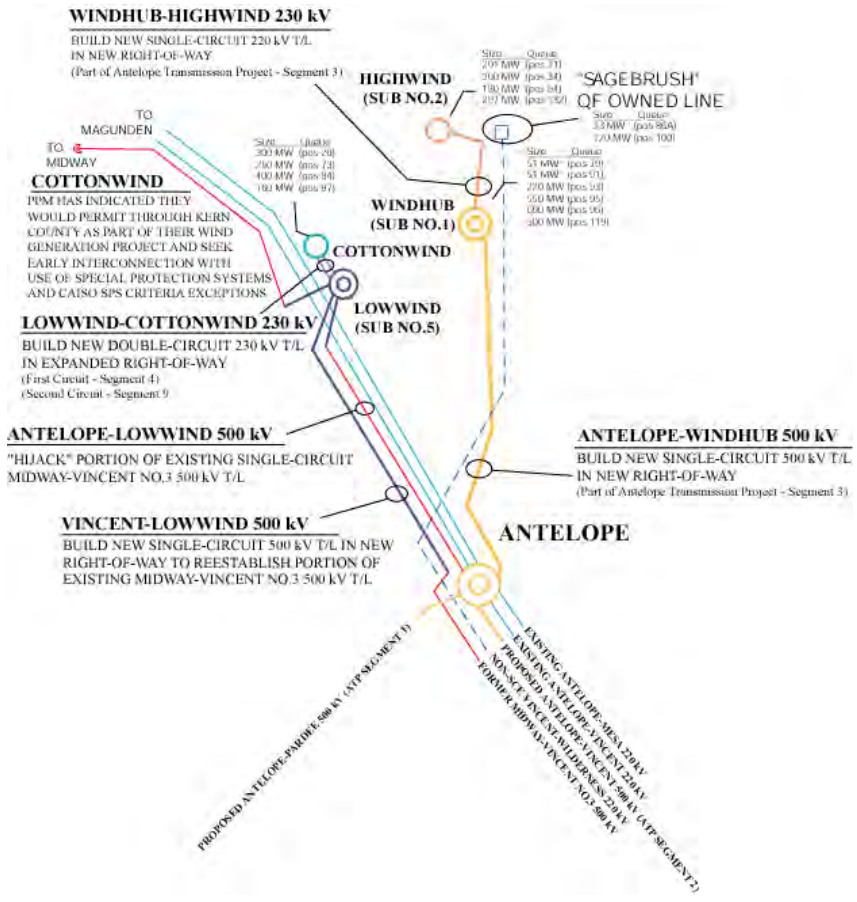
Segment 4
LowWind 500 kV Transmission Elements

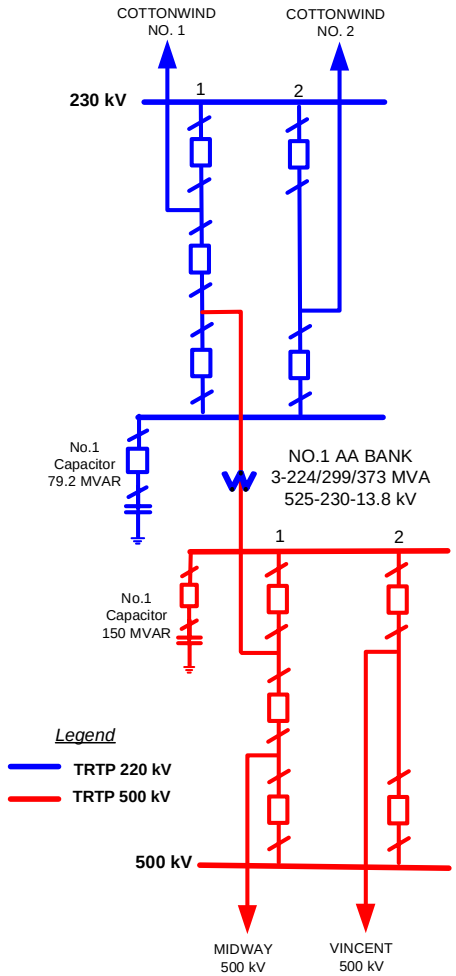


Without Segment 4

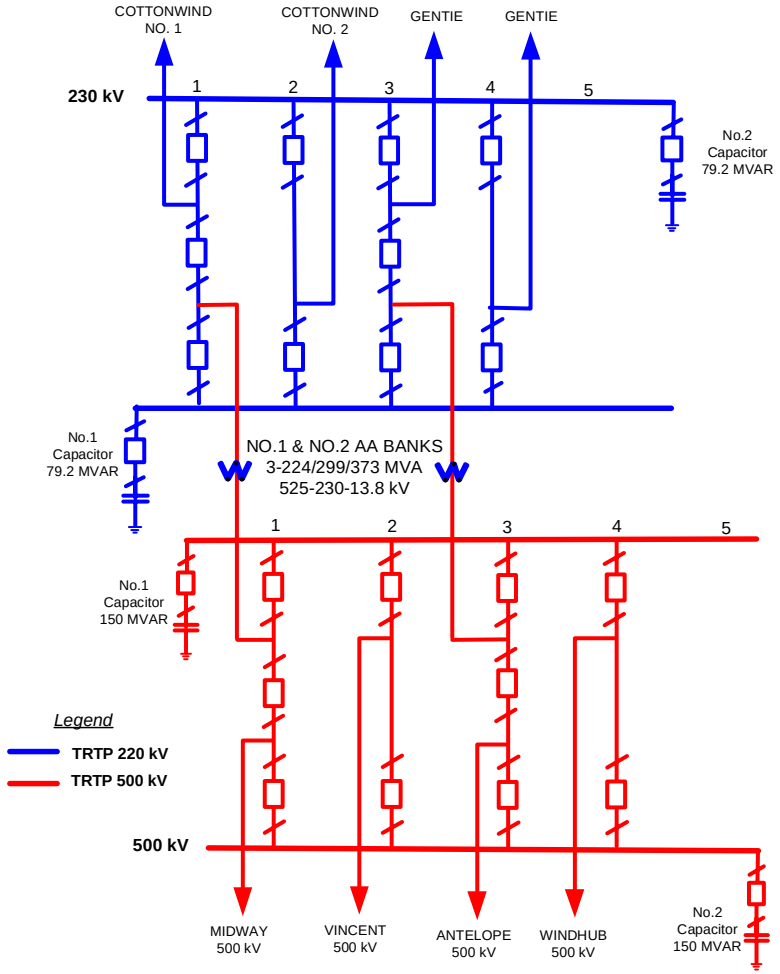


With Segment 4

Segment 4 – LowWind 500/230 kV Substation

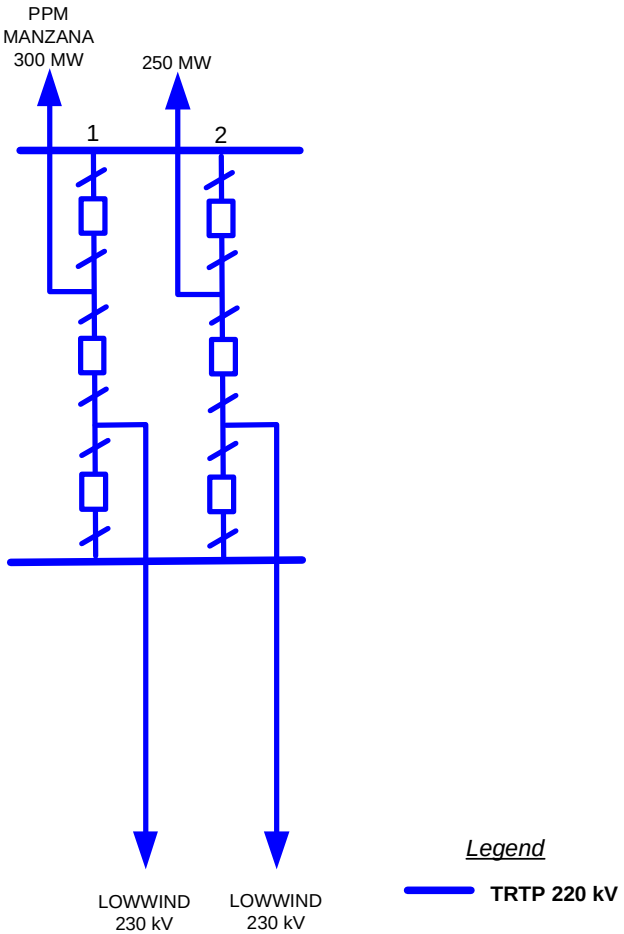


Initial Substation Requirements

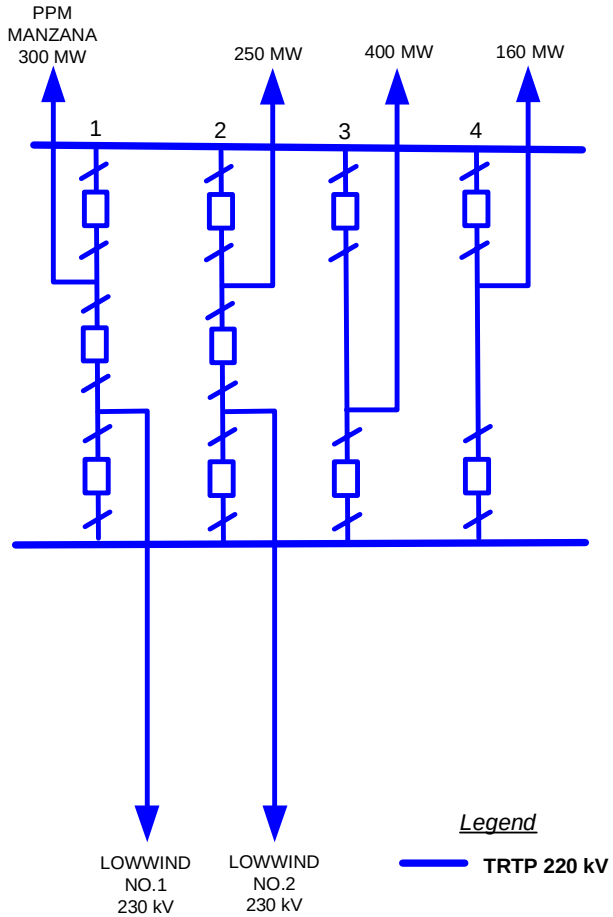


Ultimate Substation Requirements

Segment 4 – Cottonwind 230 kV Substation
(To Be Permitted by Kern County)



Initial Substation Requirements



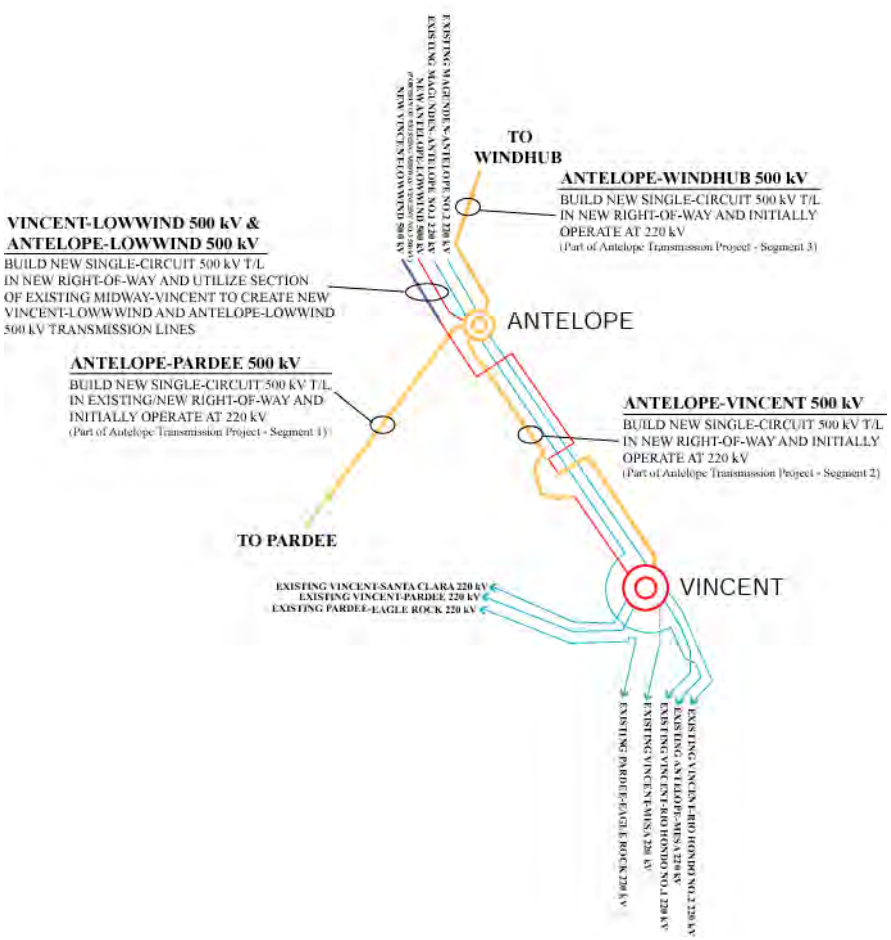
Ultimate Substation Requirements

Segment 5
Antelope-Vincent No.2 500 kV T/L

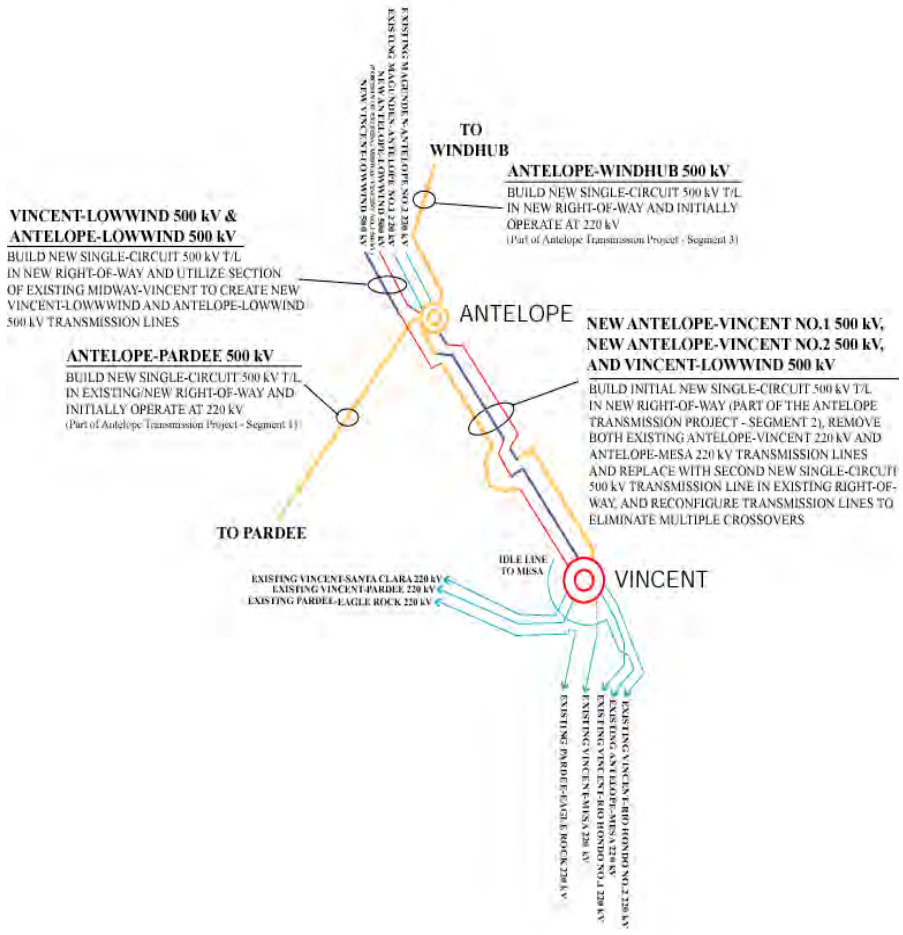
- Major Components
  - Removal of both Antelope-Vincent and a portion of the existing Antelope-Mesa 220 kV between Antelope and Vincent Substations
  - New 18-mile Antelope-Vincent No.2 single-circuit 500 kV transmission line in existing ROW
- Segment 5 Dependencies for Simultaneous Outages of Antelope-Vincent and Antelope-Mesa 220 kV Transmission Lines
  - Antelope Transmission Project Segment 1 (Antelope-Pardee)
  - Antelope Transmission Project Segment 2 (Antelope-Vincent)
- Conceptual Engineering Level Cost Estimate: $46 million
- Schedule

Major Component	Engineering		Material		ROW Acq'd	Construction		O.D.
	Start	End	Start	End		Start	End	
Removal of Existing Facilities	-	-	-	-	N/A	08/09	11/09	-
Antelope-Vincent No.2 500 kV	11/08	10/09	02/09	04/10	N/A	05/10	03/11	03/11

Segment 5
Antelope-Vincent No.2 500 kV T/L



Without Segment 5



With Segment 5

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Segment 6
New Replacement Vincent-Rio Hondo No.2 T/L

- Major Components
  - Removal of approximately 27 miles of the existing Antelope-Mesa 220 kV between Vincent Sub and the City of Duarte
  - New 27-mile single-circuit 500 kV transmission line on existing ROW
  - Utilize portion existing Vincent-Rio Hondo No.2 to complete circuit
- Segment 6 Dependencies for Outage of Antelope-Mesa 220 kV
  - Antelope Transmission Project Segment 1 (Antelope-Pardee)
  - Antelope Transmission Project Segment 2 (Antelope-Vincent)
  - Segment 6 can be done in parallel with Segment 5
- Conceptual Engineering Level Cost Estimate: $475.5 million for Segments 6, 7, & 8
- Schedule

Major Component	Engineering		Material		ROW Acq'd	Construction		O.D.
	Start	End	Start	End		Start	End	
Remove Antelope-Mesa section	-	-	-	-	-	02/09	09/09	-
Vincent to City of Duarte 500 kV*	11/08	10/09	02/09	04/10	N/A	05/10	11/11	11/11

•Helicopter construction in ANF will result in longer construction time
•Final Engineering required before ordering specific materials (i.e. tower legs)

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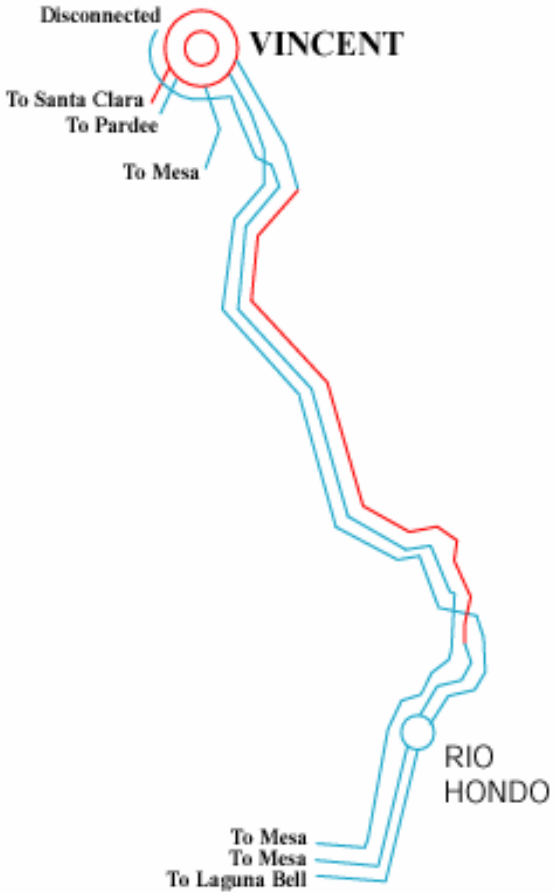
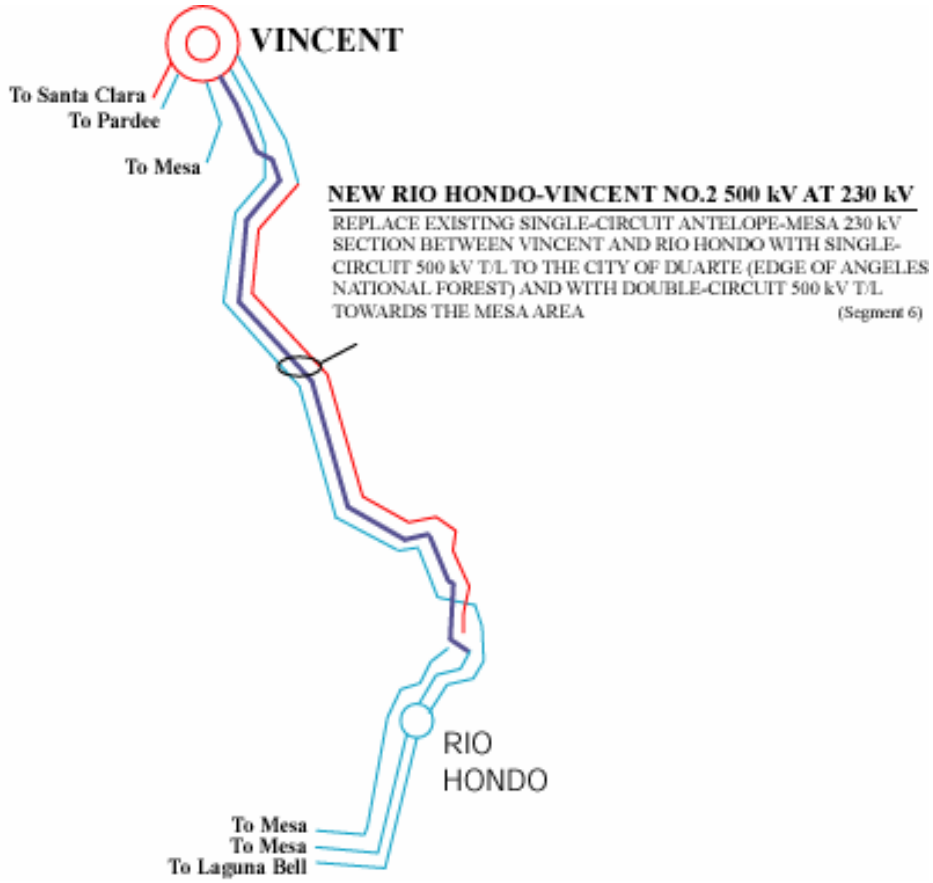
Segment 6
New Replacement Vincent-Rio Hondo No.2 T/L



Without Segment 6



With Segment 6

Segment 7
New Vincent-Mira Loma 500 kV T/L (Vincent-Mesa Area)

- Major Components:
  - Replace approximately 5 miles of existing Vincent-Rio Hondo No.2 220 kV from Vincent to Angeles National Forest (ANF) boundary with 500 kV T/L
  - Replace the remaining 15 miles of existing Antelope-Mesa 220 kV with new double-circuit 500 kV from the City of Duarte to the Mesa area
  - Relocate several existing 66 kV subtransmission line between the Rio Hondo and Mesa areas
- Segment 7 Dependencies
  - Antelope Transmission Project Segment 1 (Antelope-Pardee)
  - Antelope Transmission Project Segment 2 (Antelope-Vincent)
  - Tehachapi Renewable Transmission Project Segment 6 (Vincent-Rio Hondo)
- Conceptual Engineering Level Cost Estimate: $475.5 million for Segments 6, 7, & 8
- Schedule

Major Component	Engineering		Material		ROW Acq'd	Construction		O.D.
	Start	End	Start	End		Start	End	
Remove 220 kV Vincent to ANF	-	-	-	-	-	11/11	02/12	-
Remove 220 kV Duarte to Mesa	-	-	-	-	-	02/09	05/09	-
Construct Vincent to ANF 500 kV	11/08	10/09	02/09	04/10	N/A	01/12	04/12	04/12*
Relocate Existing 66 kV	11/08	10/09	02/09	12/09	Franchise	10/09	08/10	08/10
Construct City of Duarte to Mesa**	11/08	10/09	02/09	04/10	N/A	09/10	04/11	04/12

* Cannot start until completion of replacement Vincent-Rio Hondo No.2

** Cannot construct until 66 kV subtransmission facilities are relocated

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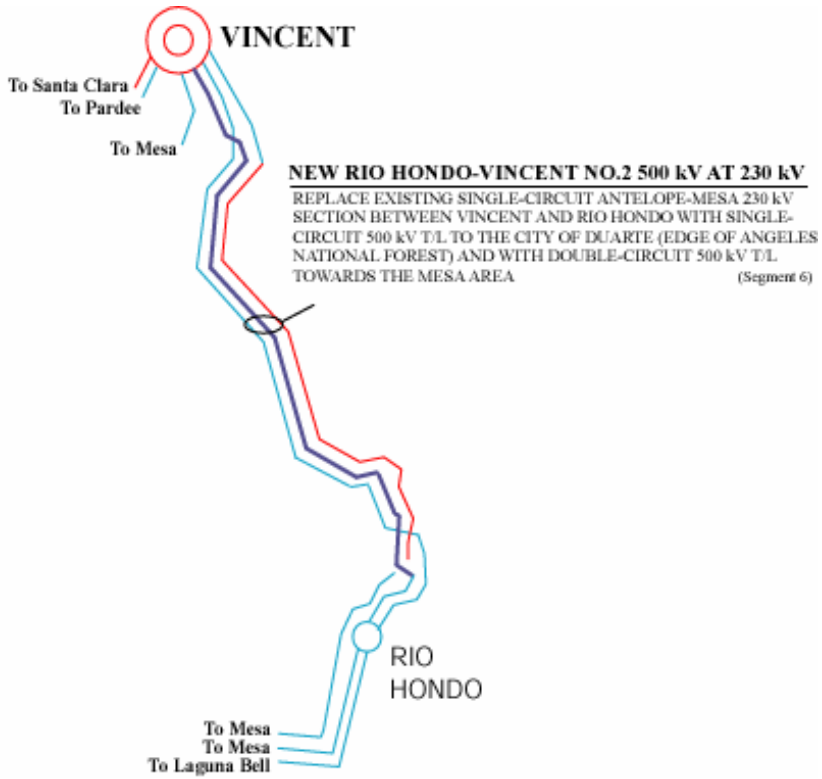
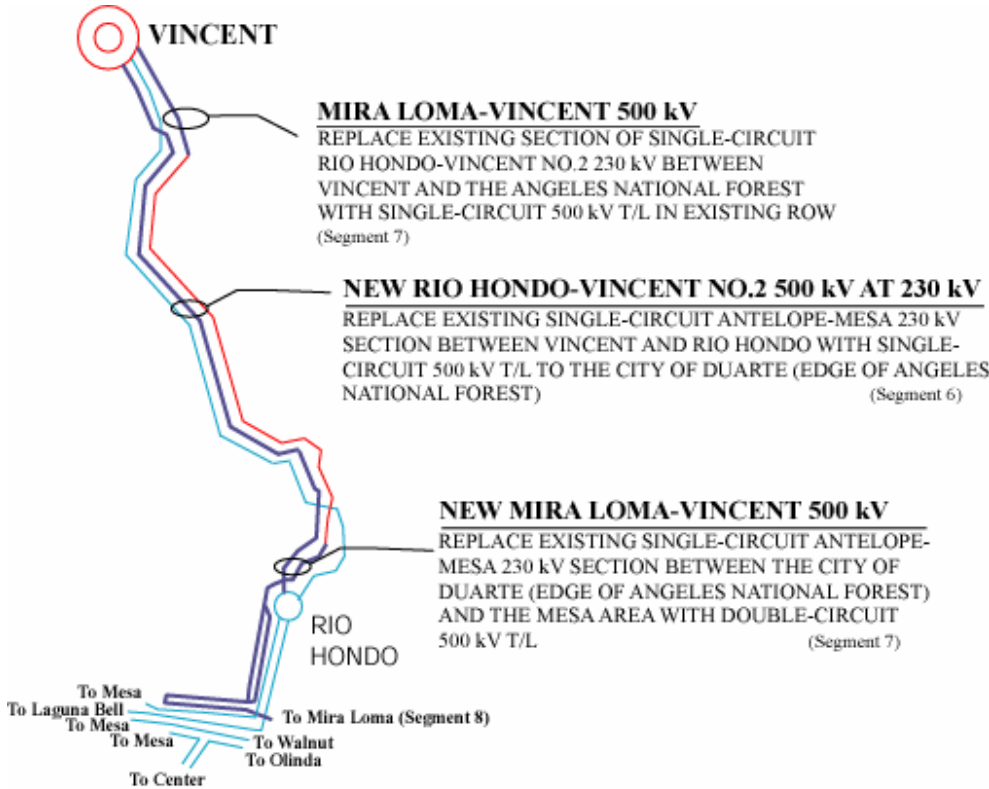
Segment 7
New Vincent-Mira Loma 500 kV T/L (Vincent-Mesa Area)





Without Segment 7

With Segment 7

Segment 8
New Vincent-Mira Loma 500 kV T/L (Mesa Area-Mira Loma)

- Major Components:
  - Removal of Mesa area to Mira Loma 220 kV transmission line
  - Rebuild Chino area to Mira Loma Single-Circuit 220 kV to Double-Circuit 220 kV
  - Relocation of existing 66 kV facilities in the Chino area
  - New double-circuit 500 kV between the Mesa area and Mira Loma mostly on existing ROW
- Segment 8 Dependencies
  - Antelope Transmission Project Segment 1 (Antelope-Pardee)
  - Antelope Transmission Project Segment 2 (Antelope-Vincent)
  - Tehachapi Renewable Transmission Project Segment 6 (Vincent-Rio Hondo)
- Conceptual Engineering Level Cost Estimate: $475.5 million for Segments 6, 7, & 8
- Schedule

Major Component	Engineering		Material		ROW Acq'd	Construction		O.D.
	Start	End	Start	End		Start	End	
Removal Mesa Area-Chino 220 kV	-	-	-	-	-	02/09	05/09	-
Chino-Mira Loma 220 kV Rebuild*	11/08	10/09	02/09	04/10	N/A	10/10	03/11	03/11
Relocate Existing 66 kV	11/08	10/09	02/09	12/09	Franchise	10/09	08/10	08/10
Mesa Area-Mira Loma 500 kV	11/08	10/09	02/09	04/10	04/10	05/10	06/11	04/12**

* Cannot take outage during summer months
** Cannot be energized until completion of Segment 7

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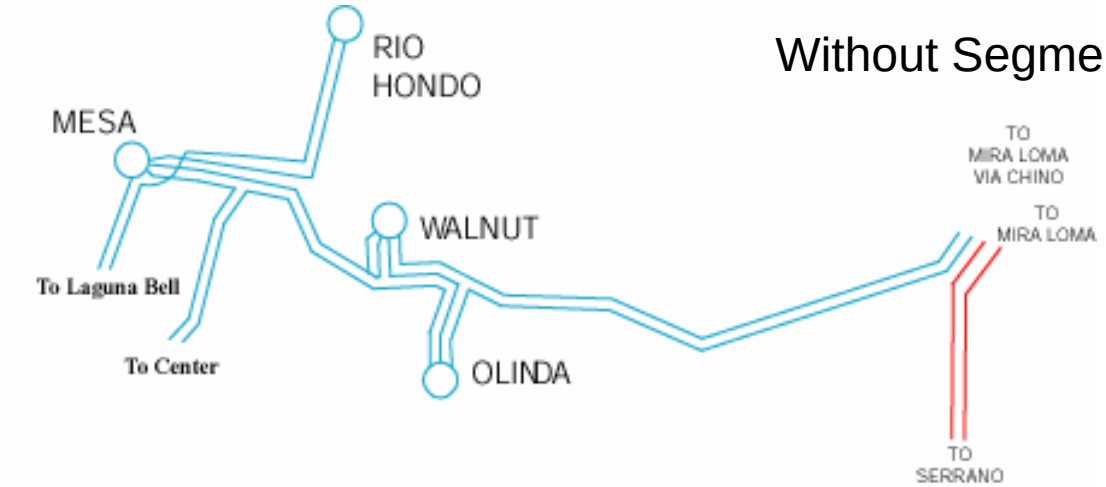
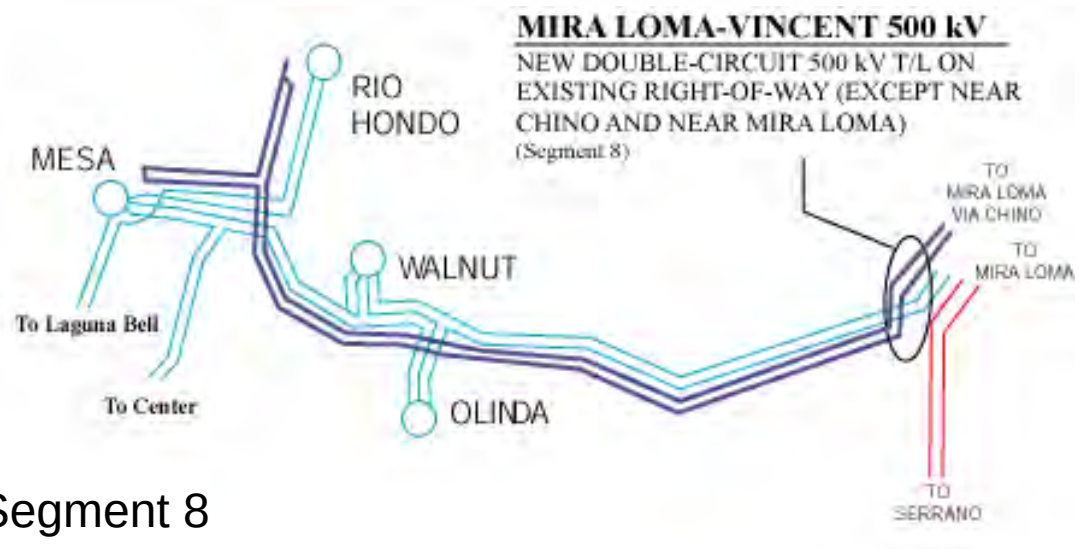
Segment 8
New Vincent-Mira Loma 500 kV T/L (Mira Loma-Mesa Area)

Without Segment 8





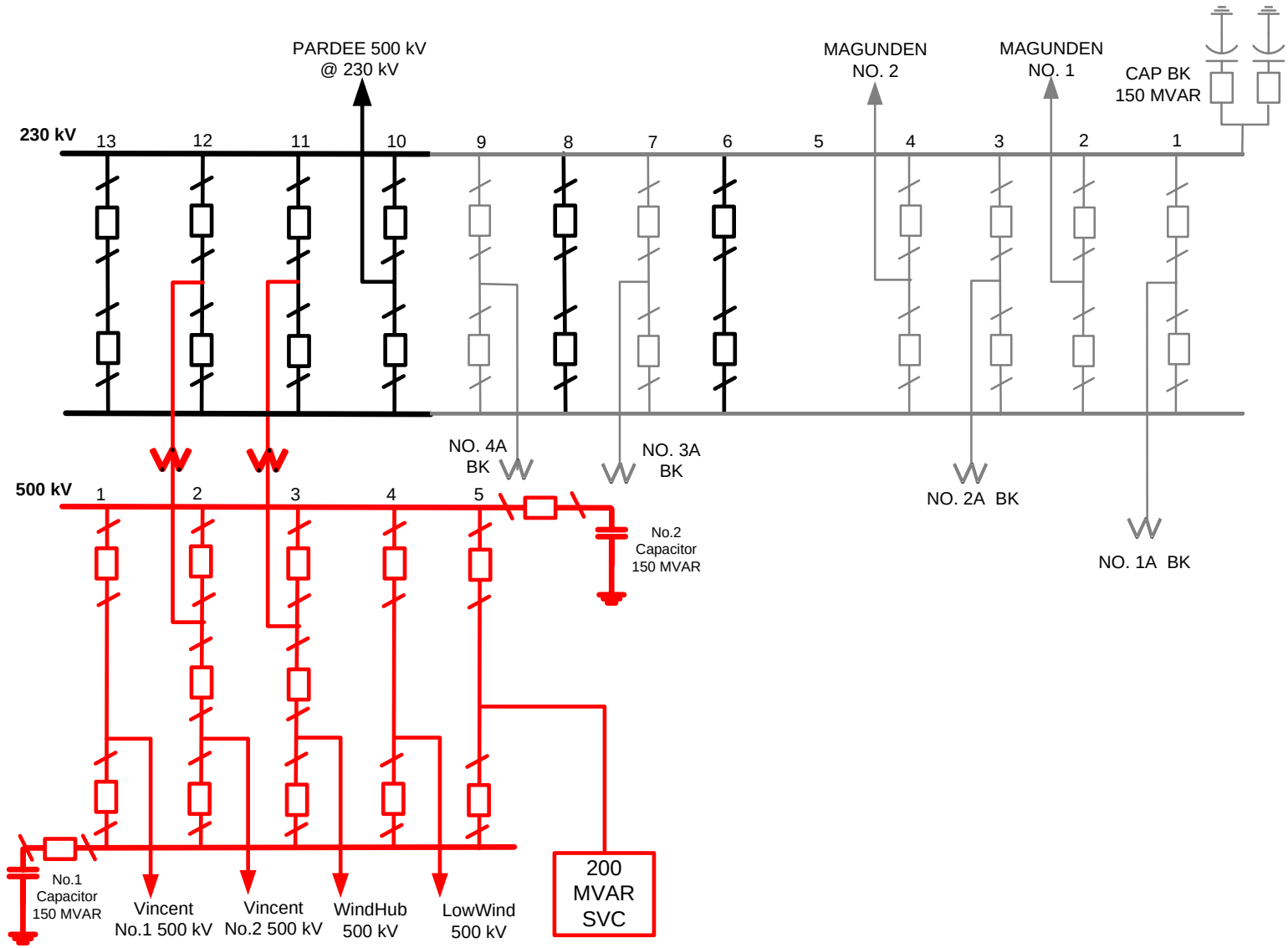
With Segment 8

Segment 9
Increase Operation to 500 kV

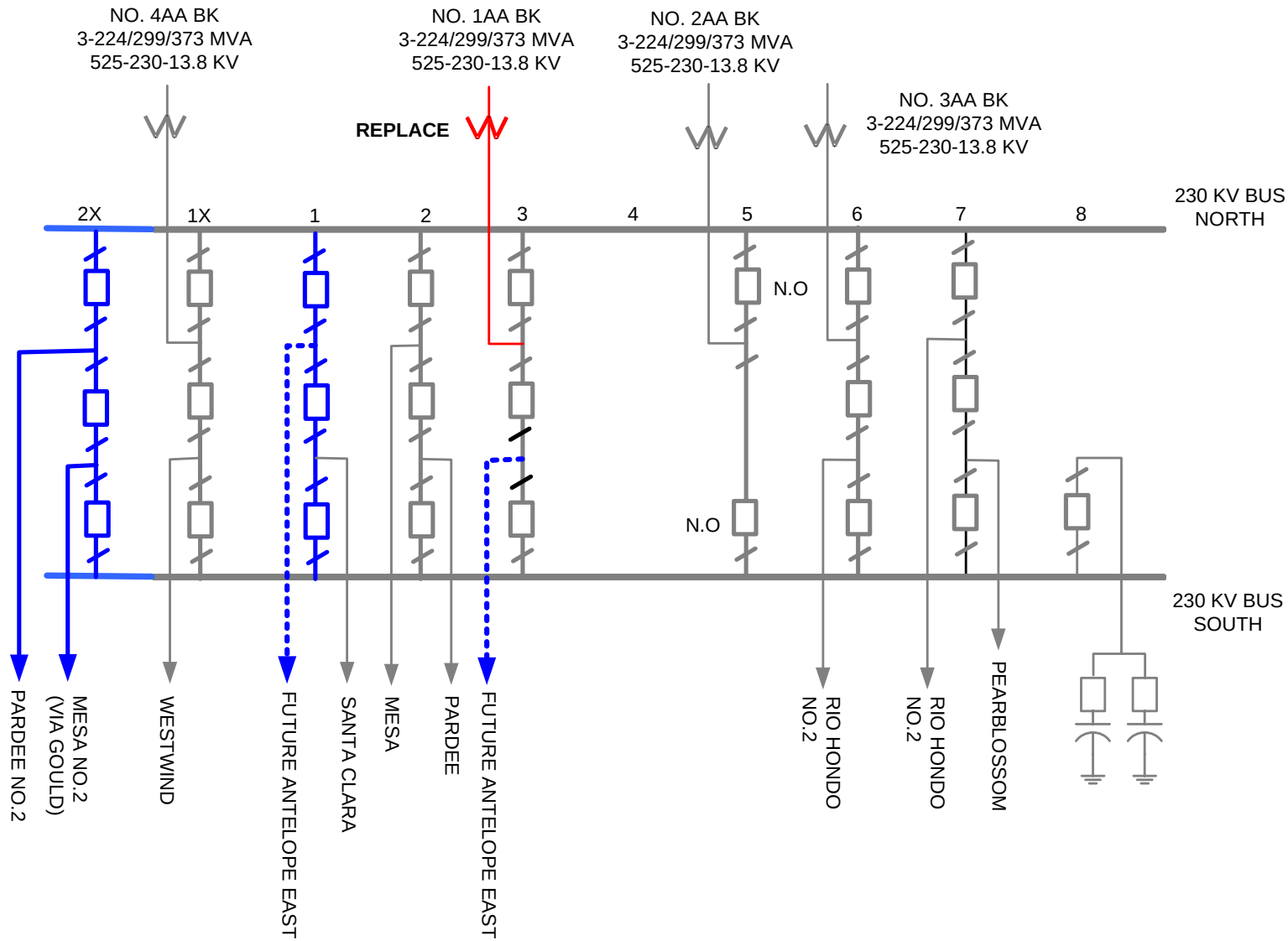
- Major Components
  - Antelope and WindHub 500 kV facilities
  - Upgrade Vincent 500 and 220 kV facilities
- Segment 9 Dependencies
  - Antelope Transmission Project Segment 1 (Antelope-Pardee)
  - Antelope Transmission Project Segment 2 (Antelope-Vincent No.1)
  - Antelope Transmission Project Segment 3 (Antelope-WindHub)
  - Tehachapi Renewable Transmission Project Segment 4 (LowWind 500 kV Sub)
  - Tehachapi Renewable Transmission Project Segment 5 (Antelope-Vincent No.2)
- Conceptual Engineering Level Cost Estimate: $571 million
- Schedule

Major Component	Engineering		Material		ROW Acq'd	Construction		O.D.
	Start	End	Start	End		Start	End	
Antelope 500 kV Operation	08/08	08/09	10/08	03/10	12/07	03/10	03/11	03/11
WindHub 500 kV Operation	08/08	08/09	10/08	03/10	12/07	03/10	03/11	03/11
Vincent 500 & 220 kV Upgrades	11/08	10/09	02/09	08/10	-	09/10	09/11	09/11

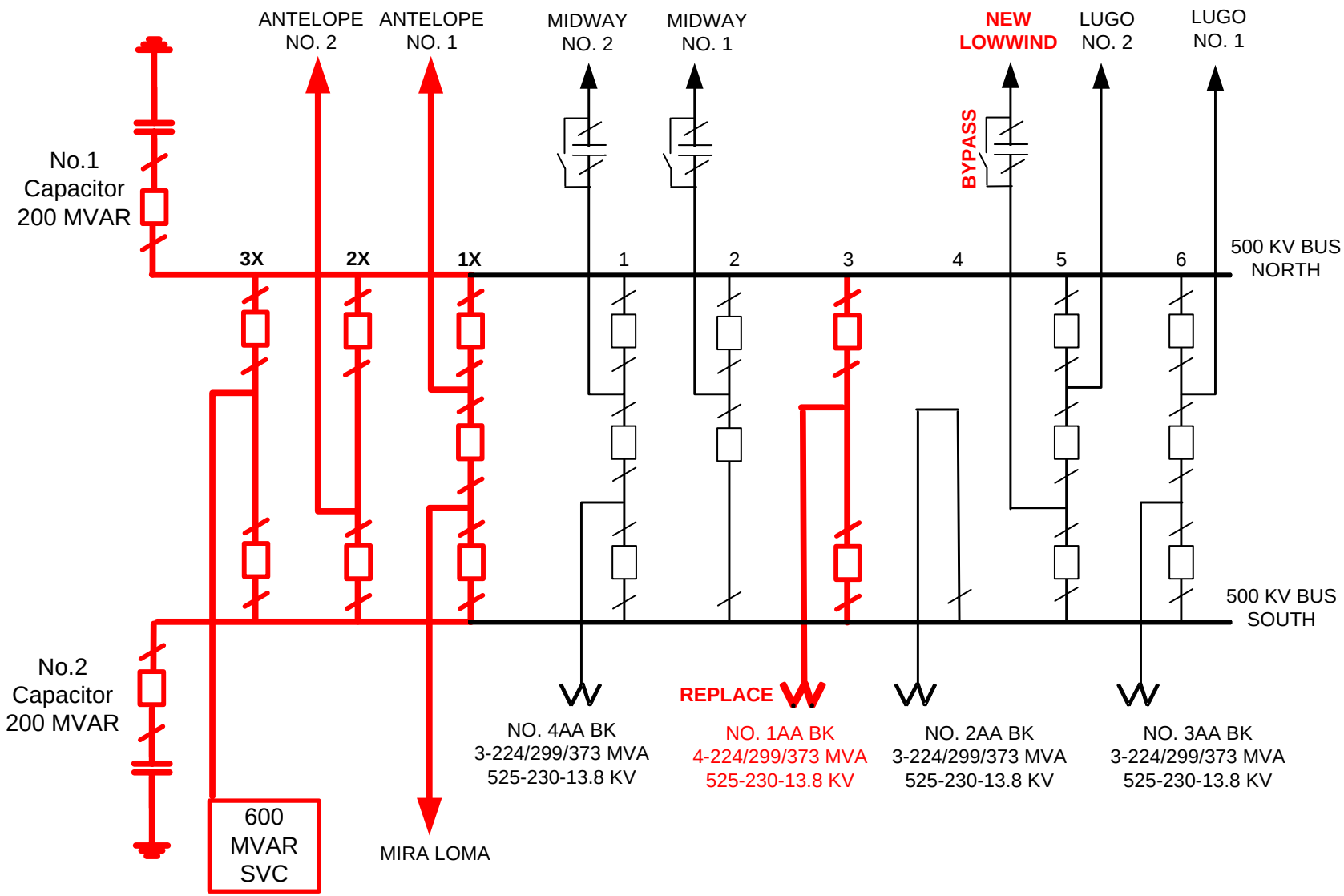
Ultimate Antelope Substation Expansion



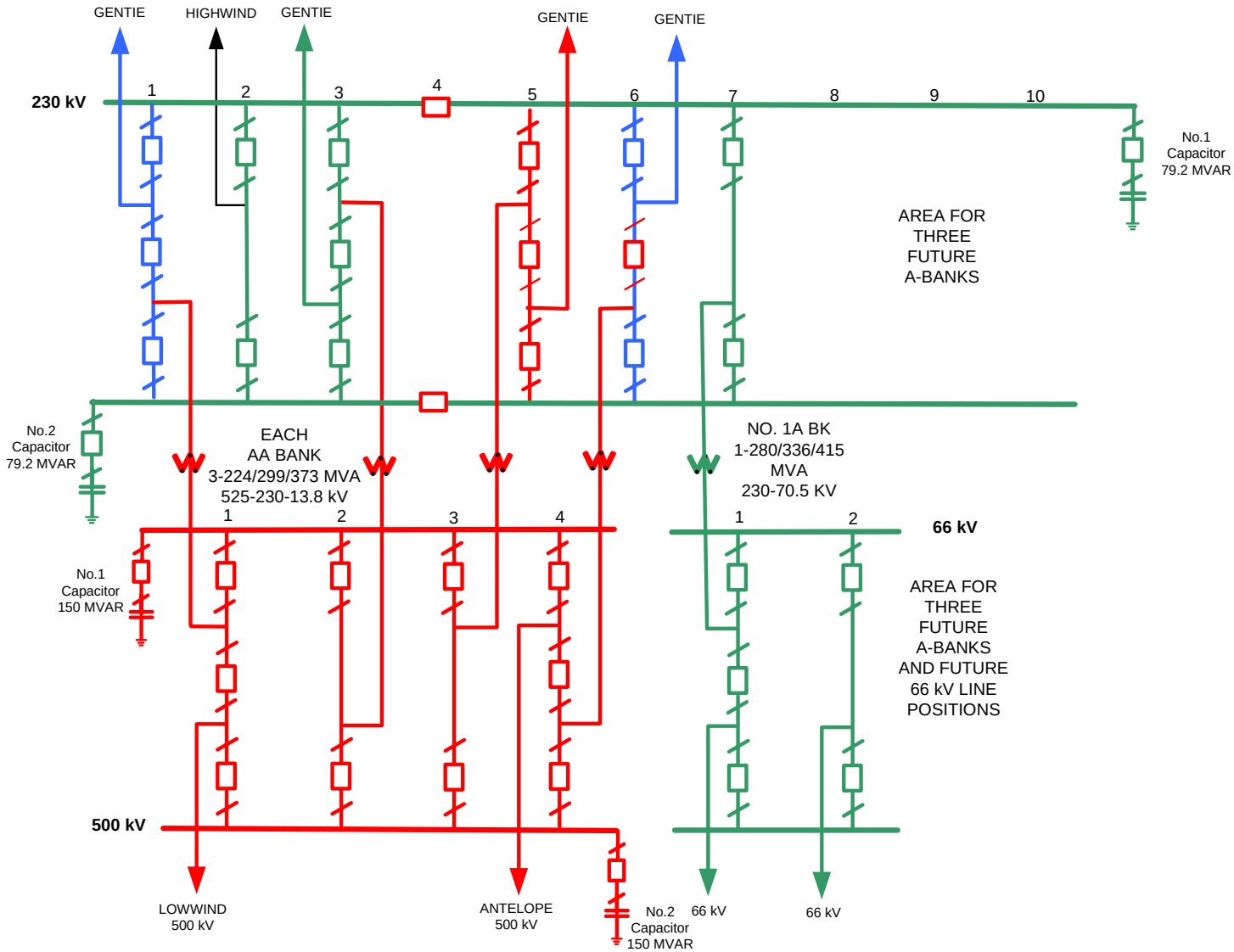
Ultimate Vincent 220kV Substation Expansion



Ultimate Vincent 500kV Substation Expansion



Ultimate WindHub Substation Expansion

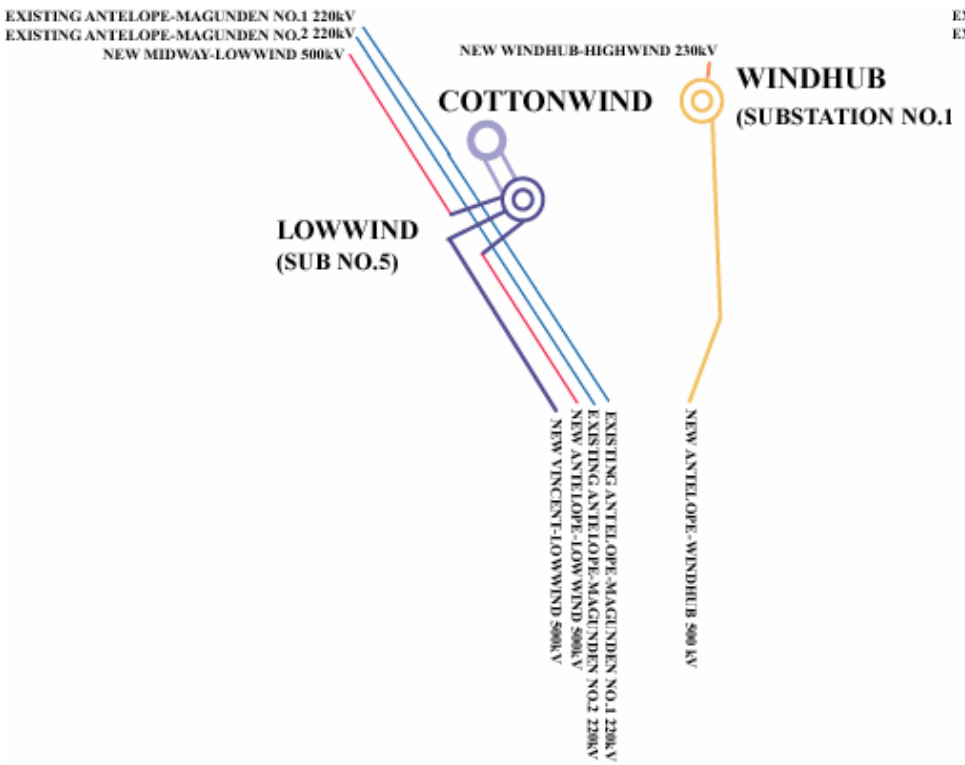


Segment 10
New LowWind-WindHub 500 kV T/L

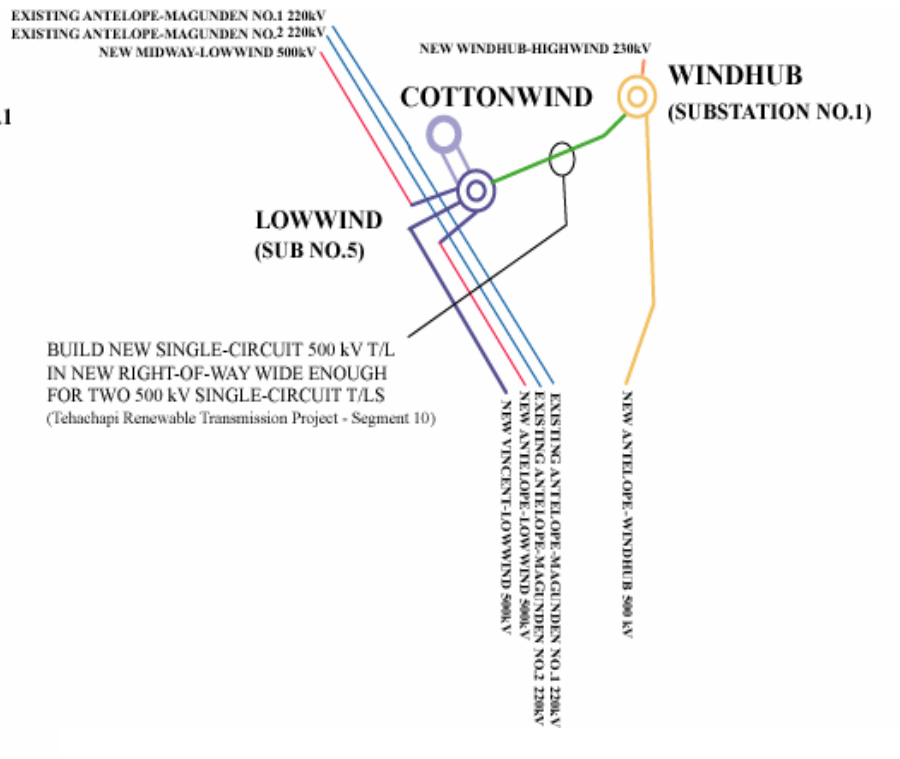
- Major Components
  - New 15-mile LowWind-WindHub single-circuit 500 kV transmission line
- Project Dependencies
  - Antelope Transmission Project Segment 1 (Antelope-Pardee)
  - Antelope Transmission Project Segment 2 (Antelope-Vincent)
  - Antelope Transmission Project Segment 3 (Antelope-WindHub)
  - Tehachapi Renewable Transmission Project Segment 4 (LowWind Substation)
  - Antelope and WindHub Substation Operation at 500 kV
- Conceptual Engineering Level Cost Estimate: $62 million
- Schedule

Major Component	Engineering		Material		ROW Acq'd	Construction		O.D.
	Start	End	Start	End		Start	End	
LowWind-WindHub 500 kV	11/08	10/09	10/09	12/10	12/09	01/11	10/11	10/11

Segment 10
LowWind-WindHub 500 kV T/L



Without Segment 10



With Segment 10

Segment 11
New Vincent-Mesa (via Gould) 500/220 kV T/L

- Major Components
  - New Pardee-Eagle Rock 220 kV Transmission Line Terminations to Vincent and Gould
  - Removal of 20 mile portion of existing Pardee-Eagle Rock between Vincent and Gould
  - New 22-mile Single-Circuit 500 kV Transmission Line between Vincent and Gould Area
  - Install second circuit on vacant tower position (25-miles) from Gould Area to Mesa
- Segment 11 Dependencies
  - Antelope Transmission Project Segment 1 (Antelope-Pardee)
  - Antelope Transmission Project Segment 2 (Antelope-Vincent No.1)
  - Tehachapi Renewable Transmission Project Segment 5 (Antelope-Vincent No.2)
  - Tehachapi Renewable Transmission Project Segment 6 (Vincent-Rio Hondo)
  - Tehachapi Renewable Transmission Project Segment 7 & 8 (Vincent-Mira Loma)
- Conceptual Engineering Level Cost Estimate: $95 million
- Schedule

Major Component	Engineering		Material		ROW Acq'd	Construction		O.D.
	Start	End	Start	End		Start	End	
Vincent and Gould Terminations	11/08	10/09	10/09	12/10	12/09	05/12	01/13	01/13
20 mile 220 kV Removal	-	-	-	-	-	04/12	09/12	-
New Vincent-Gould Area 500 kV	11/08	10/09	10/09	12/10	-	05/12	11/13	11/13
Circuit on Vacant Tower Position	07/10	06/11	07/11	09/12	-	10/12	04/13	11/13

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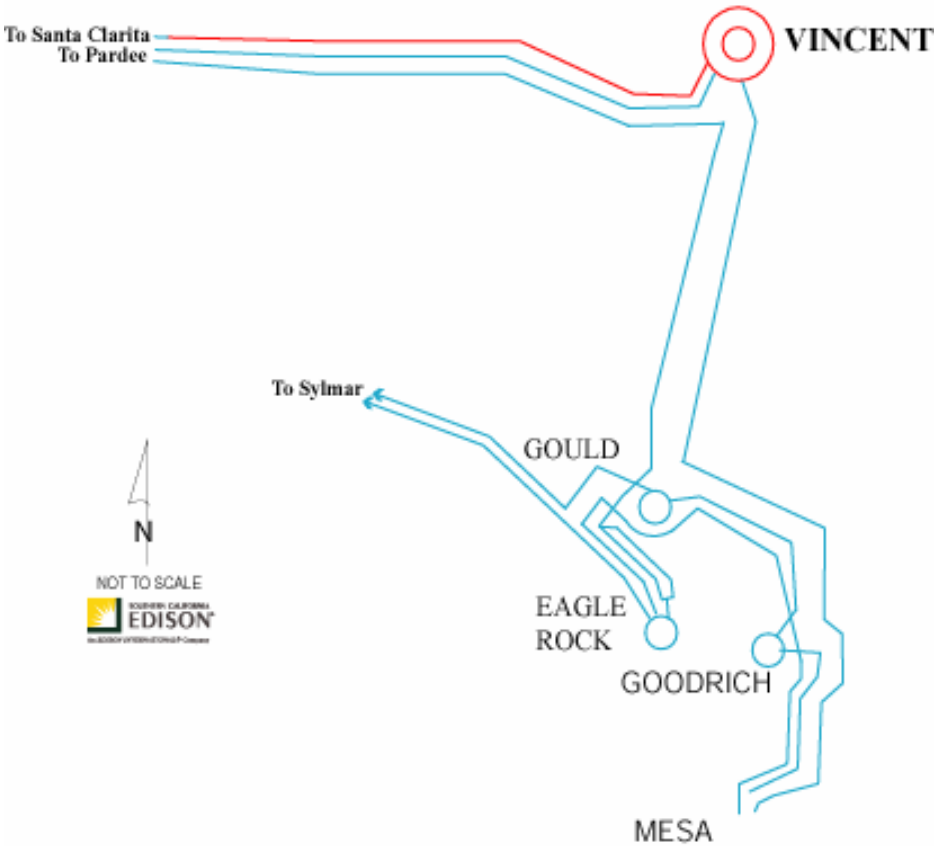
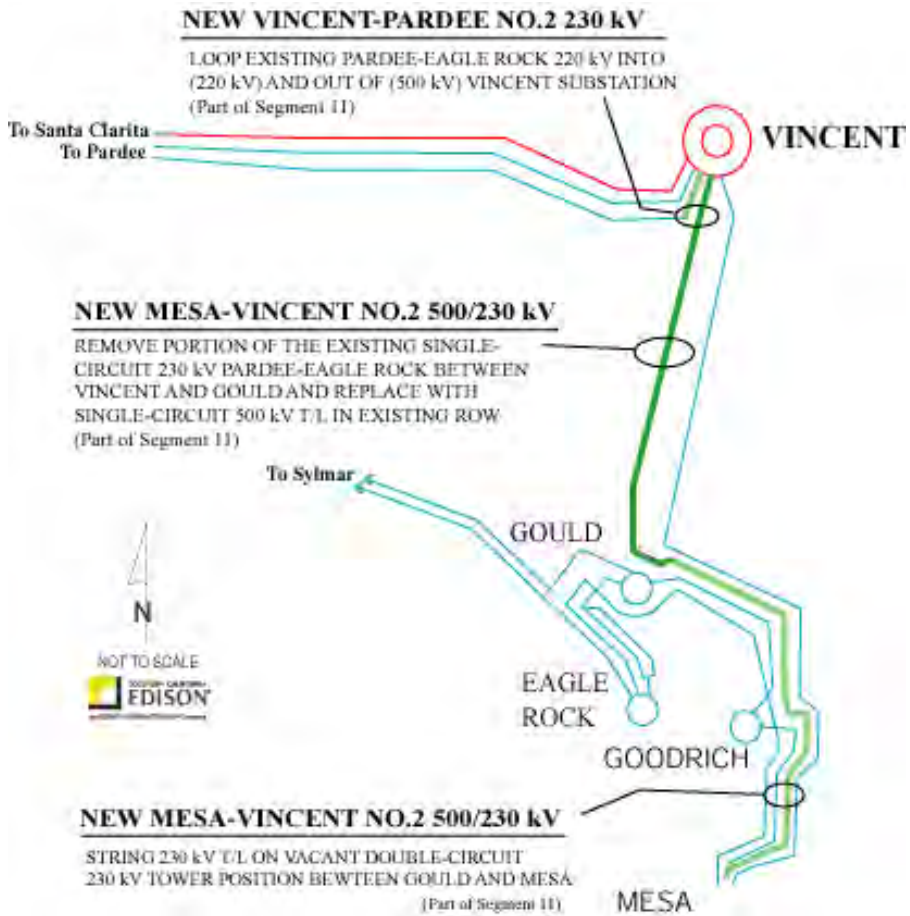
Segment 11
New Vincent-Mesa 500/230 kV T/L (via Gould)

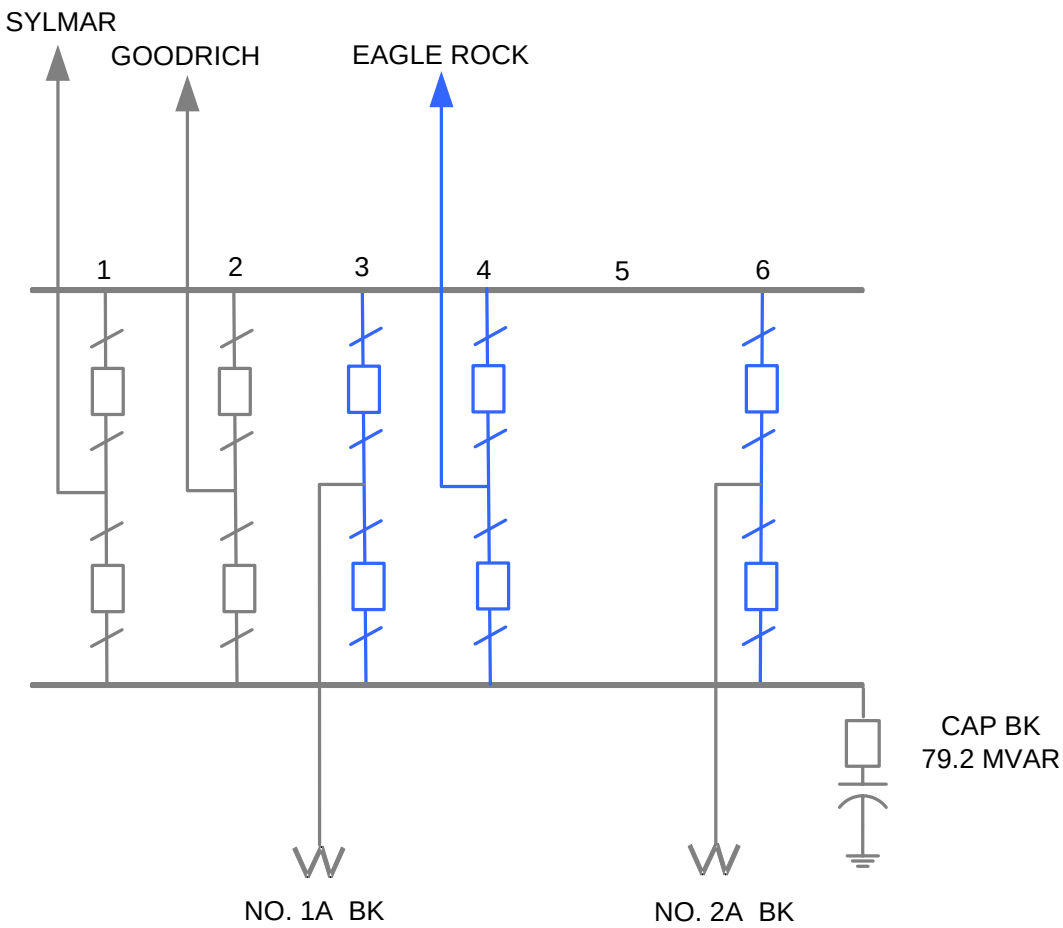


Without Segment 11



With Segment 11

Gould Substation Arrangement



Key Issues

- Licensing:
  - Single CPCN to be filed by June 29, 2007
  - USFS for south-of-Vincent rights of way
  - All permits assumed to be obtained by January 1, 2009
- Procurement and Construction Schedules:
  - Availability of key components
  - Availability of engineering, procure, and construct (EPC) contractors
  - Outage schedule/seasonal power flows on Path 26
- Cost Estimates
  - Conceptual engineering level cost estimates are +/- 40 % and are done without benefit of preliminary engineering design.
  - Preliminary engineering level cost estimates are +/- 20 % and are done without the benefit of the final engineering design and construction bids.
  - All costs are nominal in current year dollars were based on 2006 costs escalated to account for inflation (3%)
- Schedule
  - Estimates provided without the benefit of engineering design studies
  - Construction duration estimated without detailed outage coordination studies